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# Mapping of Research Output on Dyslexia: A Scientometric Study during 2015-2019

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## Abstract

Scientometrics is a sub field of bibliometrics. Mapping of research outputs on Dyslexia: A Scientometric study during 2015-2019. There are 1677 research papers were contributed by 7623 authors during 2015 – 2019, Single authors have contributed 134 research papers and Triple authors have contributed 314 research papers. The author Tzipi Horowitz-Kraus have contributed 12 research papers, Average relative growth rate is 0.027 and doubling time is 13.227. Country wide, United states have contributed 398 research papers on Dyslexia occupy the first rank and India have contributed 13 research papers occupy the 20th rank, Preferred language of authors are found to be English 1639(97.73%) on Dyslexia research. The journal "Dyslexia "(Chichester, England) have contributed 134(7.99%) research papers occupy 1st rank. Prolific contributed institutions, First Rank occupied by Behavioral Science Institute the Netherlands have contributed 15 research papers, the degree of collaboration by Subramaniam formula the mean degree of collaboration is 0.920. shows that 92% of contributions are from collaborative authors. Dyslexia research shows remarkably low by India, it is necessary to give awareness to people on Dyslexia. The funding agencies and Government of India should take initiation to encourage the researchers to contribute more research papers on Dyslexia. The researchers should collaborate with other countries to enrich their knowledge on Dyslexia.

**Keyword**: Scientometric Study, Dyslexia, Reading Disability, authorship pattern, Collaborative study, Relative growth rate.

## Introduction

Scientometric is the application of mathematics on Science and Scientific publications. "Scientometrics is the investigation of science as development of information process", (Nalimov and Mulchenk 1969)[1]. Dyslexia is a learning disorder that involves difficulty reading due to problems identifying speech sounds and learning how they relate to letters and words (decoding)[2]. Also called reading disability, dyslexia affect areas of the brain that process language. People with dyslexia have normal intelligence and commonly have ordinary vision. Most youngsters with dyslexia can achieve school with tutoring or a specialized schooling application. Emotional help additionally plays a critical role. Though there's no treatment for dyslexia, early assessment and

intervention result in the quality final results. Sometimes dyslexia cross undiagnosed for years and isn't identified till maturity, but it's never too late to seek help.

**Symptoms**

The side effects of dyslexia can be difficult to spot until your youngster begins school. An instructor may be the first to see the signs, particularly if your kid battles to peruse, spell, and adhere to guidelines in the class room.

Children who had the option to conceal their indications in primary school may begin to experience difficulty in center school as the requests on them increment. They can likewise pull back socially as it gets more earnestly for them to speak with their friends.

**Review of Literature**

**Sofiya, Joy; Kavitha, S.; Ponnudurai, R (2018)[3]** described the features of co authorship trends and patterns in dyslexia research output during 1989-2017 using Web of Science data base. The study shows that multiauthor contributions predominant than single author. The author Shaywitz SE J has got highest 7383 global citations against 54 publications.

**Gupta, R., Ahmed, K. M., Gupta, B. M., & Bansal, M. (2016)**[4].examined the 3653 Indian publications on Lung cancer retrieved from Scopus database during 2005-2014, analyzed data for annual average growth rate, Citation Impact, most productive 15 countries, India's Global publication share the most productive states in India on lung cancer research, there are 31papers received more citations with an average 294.74 /paper. It is necessary that the government should take steps to develop a National Cancer Prevention Policy. To protect the people by giving health education and advice to follow the dietary style which will make us healthy and away from such diseases.

**Venkatesan, S. (2017)[5].** analyzed the research collaboration between clinical psychology vis a viz speech language and hearing in India from 38 back volumes 90 samples out of 710 published research articles. The analysis found that 2/3 of publications are contributed by single authors (67.77%) the collaborative authors contribution is low.

**Uma Devi, L. N., & Thirumal, K. (2019)[6].** Analyzed the Liver Diseases research output during 2012 -2017 by collecting data using web of science database. The collected data is analyzed for source wise research output, year wise, authorship pattern and country wise. India have contributed remarkable quantity of publications on Liver Diseases

**Janaarthanan Mr., P. I., Nithyanandam Dr, K., & Natarajan Dr, M. (2019)**[7]. Analyzed the published osteoporosis in children research articles during 1950-2018 by collected data from PubMed data base. There are 4837 records were found, the study is performed for authorship pattern, relative growth rate, authors preferred language for publication was found to be English, and United states have contributed 1817 research papers. The relative growth rate is increasing and doubling time decreasing year by year. Scientometric study explained all details related to Osteoporosis which may be helpful for researchers and librarians

**Methodology**

The data was collected from PubMed Data base during 2015-2019 using key word "Dyslexia" the collected data is arranged in excel format, analyzed for authorship pattern, year wise growth of literature, relative growth rate and doubling time, ranking author, ranking institutions, ranking the country,

**Objective of the study**

To find the year wise growth of literature

To find the authorship pattern.

To find the Prolific number of contributed authors.

To find the relative growth rate and doubling time

To find the Geographical wide contribution

To find the author preferred language of publication

To find the prolific contributed Journal

To find the affiliated institutions with more contributions.

To find the degree of collaboration

**Analysis**

**Table 1**

Year wise growth of Literature output on Dyslexia during 2015 -2019.

| Year | Number of Papers | Cumulative | Percentage |
|---|---|---|---|
| 2015 | 351 | 351 | 20.93 |
| 2016 | 327 | 678 | 19.50 |
| 2017 | 320 | 998 | 19.08 |
| 2018 | 364 | 1362 | 21.71 |
| 2019 | 315 | 1677 | 18.78 |
| | 1677 | | 100 |
| Average growth | 335.4/year | | |

Table 1 reveals the year wise growth of research literature on Dyslexia. In the year 2015 and 2018 the growth is slightly increased 351 and 364 respectively. The total number of articles found to be 1677 with an average output of 335.4 articles per year.

**Table 2**

Authorship Pattern analysis of dyslexia literature

| Author type | Number of Contributions | Number of authors | Percentage |
|---|---|---|---|
| Single | 134 | 134 | 7.99 |

| | | | |
|---|---|---|---|
| Double | 291 | 582 | 17.35 |
| Triple | 314 | 942 | 18.72 |
| Four | 278 | 1112 | 16.58 |
| Five | 234 | 1170 | 13.95 |
| Six | 133 | 798 | 7.93 |
| Seven | 94 | 658 | 5.60 |
| Eight | 60 | 480 | 3.58 |
| Nine | 42 | 378 | 2.50 |
| Ten | 25 | 250 | 1.49 |
| Eleven | 25 | 275 | 1.49 |
| Twelve | 4 | 48 | 0.24 |
| Thirteen | 10 | 130 | 0.59 |
| Fourteen | 5 | 70 | 0.3 |
| Fifteen | 7 | 105 | 0.42 |
| Sixteen | 2 | 32 | 0.12 |
| Seventeen | 1 | 17 | 0.06 |
| Eighteen | 2 | 36 | 0.12 |
| Nineteen | 2 | 38 | 0.12 |
| Twenty | 1 | 20 | 0.06 |
| Twenty-one | 1 | 21 | 0.06 |
| Twenty-two | 2 | 44 | 0.12 |
| Twenty-three | 2 | 46 | 0.12 |
| Twenty-five | 1 | 25 | 0.06 |
| Twenty-six | 3 | 78 | 0.178 |
| Twenty-seven | 1 | 27 | 0.06 |
| Thirty-one | 2 | 62 | 0.12 |
| Forty-five | 1 | 45 | 0.06 |
| | 1677 | 7623 | 100 |

Table 2 explains that 7623 authors contributed 1677 research papers. Single authors have contributed 134 research papers and Triple authors have contributed 314 research papers.

**Table 3**

Prolific top 5 authors and ranking the contributed authors

| Author Name | Number of Contributions | Percentage | Rank |
|---|---|---|---|
| Tzipi Horowitz-Kraus | 12 | 0.715 | 1 |
| Yafit Gabay | 9 | 0.537 | 2 |
| James H Smith-Spark | 7 | 0.417 | 3 |
| Jing Zhao, Margaret J Snowling, Mark an Eckert, Nathalie Gouleme, Rachel Schiff | 6 | 0.358 | 4 |
| Eddy Cavalli, Gorka Fraga Gonzalez, Jeremy M Law, Krishna Moll, Li-Chih Wang, Sietske van Viersen | 5 | 0.298 | 5 |

Table 3 reveals the name of the author who contributed more articles on dyslexia research. Tzipi Horowitz-Kraus have contributed 12 research papers occupy the first position. 2nd by Yafit Gabay contributed 9 research papers and 3rd by James H Smith Spark contributed 7 research papers.

**Table 4**

Relative Growth Rate and Doubling Time

| Year | Number of Papers | Cumulative | $W_1$ | $W_2$ | RGR | DT |
|---|---|---|---|---|---|---|
| 2015 | 351 | 351 | | 5.860 | | |
| 2016 | 327 | 678 | 5.860 | 6.519 | 0.659 | 1.05 |
| 2017 | 320 | 998 | 6.519 | 6.906 | 0.387 | 1.79 |
| 2018 | 364 | 1362 | 6.906 | 7.217 | 0.611 | 1.13 |
| 2019 | 315 | 1677 | 7.217 | 7.425 | 0.208 | 3.33 |
| | | | | Average | 0.466 | 1.83 |

Table 4 shows the relative growth rate and doubling time. Average relative growth rate is 0.466 and doubling time is 1.83.

Table 5

Geographical Wide contribution

| Name of the Country | Number of Contributions | Percentage | Rank |
|---|---|---|---|
| USA | 398 | 23.73 | 1 |
| United Kingdom | 181 | 10.79 | 2 |
| Italy | 128 | 7.63 | 3 |
| Netherland | 96 | 5.72 | 4 |
| France | 76 | 4.53 | 5 |
| China | 71 | 4.23 | 6 |
| Germany | 68 | 4.05 | 7 |
| Israel | 61 | 3.64 | 8 |
| Australia | 58 | 3.46 | 9 |
| Canada, Spain | 42 | 2.50 | 10 |
| Belgium | 36 | 2.15 | 11 |
| Brazil | 33 | 1.97 | 12 |
| Finland | 25 | 1.49 | 13 |
| Hong Kong | 22 | 1.31 | 14 |
| Portugal | 21 | 1.25 | 15 |
| Denmark, Japan | 19 | 1.13 | 16 |
| Iran, Sweden | 16 | 0.95 | 17 |
| Poland | 15 | 0.89 | 18 |
| Norway | 14 | 0.83 | 19 |
| India | 13 | 0.77 | 20 |

Table 5 shows the prolific contributed countries. It is found that United states have contributed 398 research papers on Dyslexia occupy the first rank. United Kingdom have contributed 181

research papers occupy the 2nd rank Italy have contributed 128 research articles occupy the 3rd rank and India have contributed 13 research papers occupy the 20th rank.

**Table 6**

The preferred language of authors

| S.no | Language | Number of contributions | Percentage | Rank |
|---|---|---|---|---|
| 1 | English | 1639 | 97.73 | 1 |
| 2 | Germany | 12 | 0.72 | 2 |
| 3 | Japan | 12 | 0.72 | 2 |
| 4 | French | 5 | 0.298 | 3 |
| 5 | Spanish | 4 | 0.239 | 4 |
| 6 | Chinese | 3 | 0.179 | 5 |
| 7 | Hungarian | 1 | 0.059 | 6 |
| 8 | Poland | 1 | 0.059 | 7 |
| | | 1677 | 100 | |

Table 6 reveals the preferred language of authors for contribution of research papers on Dyslexia. There are 1639(97.73%) research papers were contributed in English language, Germany language have contributed 12(0.72%) research papers, Japan language have contributed 12 research papers. French language has contributed 5 papers, Spanish language have contributed 4 papers, Chinese language have contributed 3 papers, Hungarian and Poland have contributed each 1 research papers.

**Table 7**

Prolific top 10 journals

| S. No | Name of the Journals | Number of Contribution | Percentage | Rank |
|---|---|---|---|---|
| 1 | Dyslexia (Chichester, England) | 134 | 7.99 | 1 |
| 2 | Journal of learning disabilities | 94 | 5.60 | 2 |
| 3 | Annals of dyslexia | 91 | 5.43 | 3 |
| 4 | Frontiers in psychology | 83 | 4.95 | 4 |
| 5 | Research in developmental disabilities | 44 | 2.62 | 5 |
| 6 | Neuropsychologia | 41 | 2.44 | 6 |
| 7 | PLoS one | 35 | 2.09 | 7 |
| 8 | Scientific reports | 31 | 1.85 | 8 |
| 9 | Cortex; a journal devoted to the study of the nervous system and behavior | 27 | 1.61 | 9 |
| 10 | Frontiers in human neuroscience, Journal of speech, language, and hearing research (JSLHR.) | 25 | 1.49 | 10 |

Table 7 reveals the prolific contributed journals on dyslexia. The journal “Dyslexia “(Chichester, England) have contributed 134(7.99%) research papers occupy 1st rank, Journal of learning disabilities have contributed 94(5.60%) research papers occupy the 2nd rank, Annals of dyslexia have contributed 91(5.43%) research papers occupy the 3rd rank.

**Table 8**

Top 5 Affiliated Institutions on Dyslexia contribution

| S. No | Name of the Institutions | Number of contributions | Rank |
|---|---|---|---|
| 1 | Behavioral Science Institute, Radboud University, Postbus 9104, 6500 HE Nijmegen, The Netherlands. Electronic address: claraafrancisco@gmail.com. | 15 | 1 |
| 2 | UMR 1141, Institute National de la Santé et de la Recherche Medical - University Paris Diderot - Paris 7, Robert Debré Hospital Paris, France. | 13 | 2 |
| 3 | Department of Neuropsychology, Max Planck Institute for Human Cognitive and Brain Sciences, Stephanstraße 1a, 04103 Leipzig, Germany. Electronic address: skeide@cbs.mpg.de. | 10 | 3 |
| 4 | Developmental and Cognitive Neuroscience Laboratory, Department of General Psychology, University of Padova, 35122 Padova, Italy. | 10 | 3 |
| 5 | State Key Laboratory of Proteomics, Beijing Proteome Research Center, Beijing Institute of Radiation Medicine, Beijing, 102206, China. chenhuansym@163.com. | 10 | 3 |
| 6 | Parenting and Special Education Research Unit, KU Leuven, Leuven, Belgium. Electronic address: Jeremy.law@ppw.kuleuven.be. | 9 | 4 |
| 7 | Department of Child and Adolescent Psychiatry, Psychosomatics, and Psychotherapy, Ludwig-Maximilians-University Munich, Nußbaumstr. 5a, 80336 Munich, Germany. Electronic address: Kristina.Moll@med.uni-muenchen.de. | 8 | 5 |
| 8 | Institute for Learning and Brain Sciences, University of Washington, Seattle, Washington 98105, USA. | 8 | 5 |

Table 8 shows the prolific contributed institutions, First Rank occupied by Behavioral Science Institute, Radboud University, Postbus 9104, 6500 HE Nijmegen, The Netherlands.. Have contributed 15 research papers, Second rank occupied by UMR 1141, Institute National de la Santé et de la Recherche Medical - University Paris Diderot - Paris 7, Robert Debré Hospital Paris, France have contributed 13 research papers, 3rd rank occupied by Department of Neuropsychology, Max Planck Institute for Human Cognitive and Brain Sciences, Stephanstraße 1a, 04103 Leipzig, Germany 10 research papers.

**Table 9**

Degree of Collaboration by Subramaniam formula

$$\text{Degree of Collaboration} = \frac{\text{Number of multiple authors (Nm)}}{\text{Number of single authors (Ns)} + \text{Number of Multiple authors (Nm)}}$$

| Year | Single Author (Ns) | Multi Author (Nm) | Nm+Ns | DC=Nm/Nm+Ns |
|---|---|---|---|---|
| 2015 | 43 | 308 | 351 | 0.877 |
| 2016 | 30 | 297 | 327 | 0.908 |
| 2017 | 16 | 304 | 320 | 0.95 |
| 2018 | 25 | 339 | 364 | 0.931 |

| | | | | |
|---|---|---|---|---|
| 2019 | 20 | 295 | 315 | 0.936 |
| | 134 | 1543 | 1677 | 0.920 |

Table 9 shows the degree of collaboration by Subramaniam formula the mean degree of collaboration is 0.920. shows that 92% of contributions are from collaborative authors.

## Conclusion

Dyslexia is a learning disorder that involves difficulty in reading due to problems identifying speech sounds and learning how they relate to letters and words (decoding). There are 1677 research papers were contributed by 7623 authors during 2015 – 2019, Single authors have contributed 134 research papers and Triple authors have contributed 314 research papers. Tzipi Horowitz-Kraus have contributed 12 research papers occupy the first position. 2nd by Yafit Gabay contributed 9 research papers and 3rd by James H Smith Spark contributed 7 research papers. Average relative growth rate is 0.466 and doubling time is 1.83. Geographical wide, United states have contributed 398 research papers on Dyslexia occupy the first rank. United Kingdom have contributed 181 research papers occupy the 2nd rank Italy have contributed 128 research articles occupy the 3rd rank and India have contributed 13 research papers occupy the 20th rank, Preferred language of authors are found to be English1639(97.73%) on Dyslexia research. The journal "Dyslexia "(Chichester, England) have contributed 134(7.99%) research papers occupy 1st rank, Journal of learning disabilities have contributed 94(5.60%) research papers occupy the 2nd rank, Annals of dyslexia have contributed 91(5.43%) research papers occupy the 3rd rank. Prolific contributed institutions, First Rank occupied by Behavioral Science Institute the Netherlands have contributed 15 research papers, Second rank occupied by UMR 1141, Institute National de la Santé et de la Recherche Medical - University Paris Diderot, France have contributed 13 research papers, 3rd rank occupied by Department of Neuropsychology, Max Planck Institute for Human Cognitive and Brain Sciences, Germany have contributed 10 research papers. the degree of collaboration by Subramaniam formula the mean degree of collaboration is 0.920. shows that 92% of contributions are from collaborative authors.

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